<u>IN THE CLAIMS</u>

1. An optical fiber comprising:

a core;

a cladding over the core, light propagating through the cladding having a first selected mode group having a first eigenmode propagating at a first speed and a second eigenmode propagating at a second speed, wherein:

$$| \text{first speed} - \text{second speed} | / \text{first speed} < 5 \times 10^{-7}.$$

2. The optical fiber of claim 1 wherein the first selected mode group is not a first-order mode group.

3. The optical fiber of claim 2 wherein the first selected mode group is a second-order mode group.

4. The optical fiber of claim 1 wherein the first selected mode group has a third eigenmode propagating at a third speed, wherein:

$$| \text{first speed} - \text{third speed} | / \text{first speed} < 5 \times 10^{-7}.$$

5. The optical fiber of claim 1 wherein the first and second eigenmodes are TE and TM respectively.

6.   The optical fiber of claim 1 wherein the cladding includes an inner cladding and an outer cladding, an axial stress in the inner cladding being different than in the outer cladding.

7.   The optical fiber of claim 6 wherein the inner cladding is under an axial compressive stress.

8.   The optical fiber of claim 7 wherein the axial stress levels in the core and the outer cladding are higher than in the inner cladding.

9.   The optical fiber of claim 8 wherein the core has a higher refractive index than the cladding.

10.   The optical fiber of claim 1 wherein the core is a single-mode core.

11.   The optical fiber of claim 1 wherein the light has a wavelength between 1250 nm and 1650 nm.

12.   The optical fiber of claim 1 wherein the light has a wavelength of approximately 1540 nm.

13.   An optical fiber comprising:

a core; and

a cladding over the core wherein, if first and second portions of the fiber are secured to first and second mounts of a support structure respectively so that an interaction length of 10 cm is defined between the portions, light propagates through the core, and an end of the interaction length is vibrated at a selected frequency to produce a notch with a 10 dB depth and a 4 nm width, a wavelength of the light couples into the cladding and PDL of the wavelength in the cladding is less than 0.5 dB.

14.   The optical fiber of claim 13 wherein at least a 3 dB notch is created in the light in the core at the wavelength.

15.   The optical fiber of claim 13 wherein the wavelength is between 1250 nm and 1650 nm.

16.   The optical fiber of claim 13 wherein an increase in frequency of the vibration causes an increase in the PDL and a decrease in the frequency of the vibration causes an increase in the PDL.

17.   An optical fiber, comprising:

a core; and

a cladding over the core wherein:

$$\left| \int_0^{2\pi} \int_0^R \left(\left| E_{TM_{0m}} \right|^2 n_{r\,stress} - \left| E_{TE_{0m}} \right|^2 n_{\theta\,stress} \right) r\,dr\,d\theta - \left(n_{TM_{0m}\ no\ stress}^{eff} - n_{TE_{0m}\ no\ stress}^{eff} \right) \right| < 5 \times 10^{-7}$$

where:

R   is an outer radius of the cladding;

$E_{TM_{0m}}$ is an electric field of an m-th order of a transverse-magnetic mode,

designated the TM_{0m} mode;

$E_{TE_{0m}}$ is an electric field of an m-th order of a transverse-electric mode,

designated the TE_{0m} mode;

r is a radius of a location from a center point of the core;

θ is an angle between a reference line from the center point and a line

from the center point to the location;

$n_{TM_{0m}\ no\ stress}^{eff}$ is an effective refractive index of the TM_{0m} mode, calculated by an

optical waveguide theory when the fiber is under no residual

stress;

$n_{TE_{0m}\ no\ stress}^{eff}$ is an effective refractive index of the TE_{0m} mode, calculated by an

optical waveguide theory when the fiber is under no residual

stress;

$n_{r\,stress}(r,\theta)$ is a refractive index as perceived by an electric field polarized in a

radial direction at a location (r,θ) when the location is under a

residual stress;

$n_{\theta\,stress}(r,\theta)$ is a refractive index as perceived by an electric field polarized in a

circumferential direction at a location (r,θ) when the location is

under a residual stress.

18.   The optical fiber of claim 17 wherein the cladding has an inner portion and an outer portion, an axial stress in the inner portion being different than in the outer portion.

19.   The optical fiber of claim 18 wherein the inner portion is under an axial compressive stress.

20.   The optical fiber of claim 19 wherein the core is under an axial tensile stress.

21.   The optical fiber of claim 20, wherein the core has a higher refractive index than the cladding.

22.   The optical fiber of claim 17 wherein the cladding surrounds the core.

23.   An optical fiber, comprising:

a core, light propagating through the core having a first core selected mode group with a first core eigenmode traveling at a first core speed and a second core eigenmode traveling at a second core speed; and

a cladding over the core, light propagating through the cladding having a first cladding mode selected group with a first cladding eigenmode traveling at a first cladding speed and a second cladding eigenmode traveling at a second

cladding speed, wherein:

| (first core speed – second core speed)/first core speed - (first cladding speed – second cladding speed)/first cladding speed | < 5 x 10^{-7}.

24.   The optical fiber of claim 23 wherein the first and second core eigenmodes and the first and second cladding eigenmodes are LP01x, LP01y, LP11x, and LP11y, respectively.